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HERBICIDE TREATMENTS OF JAPANESE HONEYSUCKLE FOR RELEASING DESIRABLE REPRODUCTION OR FOR SITE PREPARATION

Abstract. Various herbicides were used to release pine or hardwood seedlings from competition of Japanese honeysuckle, or to eliminate honeysuckle in areas being prepared for regeneration. Considering both the degree of honeysuckle control and the amount of damage to desired trees, we recommend 2,4-D emulsifiable acid with application in late fall for release of hardwoods and in late summer or early fall for release of pines. A mixture of 2,4-D—picolinic acid applied during spring or early summer is recommended as a conditioning treatment to prepare an area for new regeneration.

Certain herbicides have proved effective for controlling Japanese honeysuckle in woodlands (*4*); but before we can use them safely, we need to know how they affect other vegetation. In selective treatments, which herbicides can be applied to release desirable reproduction without injuring the reproduction appreciably? Are any special methods of application necessary? In preparing sites for desirable reproduction, is the overstory injured? And how lasting are any residual effects that delay the establishment or growth of desirable reproduction?

To answer these questions, the Maryland Department of Forests and Parks and the Northeastern Forest Experiment Station established a cooperative herbicide study on small plots in 1966.[1] This note presents results observed as of October 1967.

[1] The authors thank the Dow Chemical Company and Amchem Products, Inc., for supplying the herbicides tested.

Existing Information

Foliage treatments with herbicides are generally most effective in late spring or early summer, because this is the period of maximum downward translocation (*5*). However, desired reproduction and overstory trees are also damaged most seriously at this time. Little (3) found that the succulent growth of pines is more susceptible to damage at this time than terminals that are not actively elongating. Thus late summer or early-fall applications might be safest for selective release of pines, particularly for trees small enough that their foliage will be sprayed. Hardwoods may also be more resistant to damage late in the season when they are in a dormant state. In correspondence with the senior author, John H. Kirch of Amchem Products reported that dogwood, sumac, and locust were not damaged by a November spraying of 2,4-D, 2,4,5-T, or amitrole.

In previous honeysuckle control studies, 2,4-D (2,4-dichlorophenoxyacetic acid) was found to be more effective than amitrole (3-amino-1,2,4-triazole) and of the various 2,4-D formulations, the emulsifiable acid[2] was sometimes more effective than the esters (*4*). However, Bruner and Shearin (*2*) have recommended 2 gallons of amitrole in 100 gallons of water for releasing loblolly pine from honeysuckle. And for eliminating honeysuckle before establishing reproduction, Little and Somes (*4*) recommend a mixture of 2,4-D—picolinic acid (4-amino-3,5,6-trichloropicolinic acid).[3] Dicamba (3,6-dichloro-*o*-anisic acid) was somewhat less effective. They also found that both dicamba and picolinic acid may damage established trees if sprayed on honeysuckle growing under them.

Description of Study

Release treatments.—Release treatments were applied in three stands: a white pine plantation, a loblolly pine plantation, and a stand of natural hardwood reproduction—mostly yellow-poplar. The loblolly pines were 8 to 17 feet tall; the white pines were 1 to 7 feet tall (mostly about 3 feet); and the yellow-poplars were mostly 1 to 4 feet tall, but some as tall as 10 feet.

All treatments were made with a back-pack mistblower, usually in the late summer or early fall. White pine and hardwood areas were treated on October 6, 1966. The loblolly pine area was treated on September 13;

[2] Trade name is Weedone 638. Mention of trade names should not be construed as an endorsement of a particular commercial product by the Forest Service or the U. S. Department of Agriculture.

[3] Trade name is Tordon 101 Mixture.

but a heavy rainstorm nullified the treatment, so the loblolly pine plots were re-treated on June 6, 1967. Before mistblowing in each area, all climbing vines were cut or pulled down to a height of 3 to 4 feet; and in the treatment, an attempt was made to keep the spray below that height.

Herbicide applications on a per-acre basis were as follows:

- *In the white pine area* (a) 4 pounds active ingredient of the 2,4-D emulsifiable acid in 8 gallons of water, (b) 2 gallons of the commercial amitrole (21 percent of amitrole plus some ammonium thiocyanate) in 8 gallons of water, and (c) 3 gallons of the commercial amitrole in 8 gallons of water;
- *In the loblolly pine area* the same treatments as (a) and (b) above;
- *In yellow-poplar reproduction* (a) same as (a) above, (b) 4 pounds active of a 2,4-D ester (Esteron 44) in 8 gallons of water, (c) 2 gallons of the commercial mixture of picolinic acid—2,4-D (0.54 pound active of picolinic acid and 2 pounds active of 2,4-D per gallon) in 8 gallons of water.

All treatments were applied on 0.1-acre plots, except (b) and (c) in the yellow-poplar reproduction, which were applied to 0.05-acre plots.

Conditioning treatments.—Conditioning treatments were applied in one area where yellow-poplar reproduction was desired. Herbicide was applied with a back-pack mistblower on June 8, 1966. The stand was relatively mature. Some of the overstory yellow-poplar had been cut recently, and poorer overstory hardwoods had been injected with herbicide. However, a dense mat of honeysuckle was developing on the ground.

Herbicides used on a per-acre basis were as follows: (a) 2 gallons of the commercial mixture of picolinic acid—2,4-D in 4 gallons of water; (b) 3 gallons of the same commercial mixture in 3 gallons of water; and (c) three rates of a mixture of 2,4-D—dicamba (1.8 pounds active of 2,4-D and 0.2 pound active of dicamba per gallon), 1, 2, or 3 gallons in 5 gallons of water. The first two treatments were applied on 0.5-acre plots; the others on 0.1-acre plots. In June 1967, re-treatments were made on some spots in the first two treatments.

Results

Release treatments.—Both herbicides tried in the white pine area caused appreciable damage to the pines. Trees injured by amitrole had chlorotic old needles and a brownish color on new terminal growth in the following June. One year after treatment, about half of the pines

were dead or dying in plots treated with the 2-gallon rate of amitrole, and about 75 percent were dead or dying where the 3-gallon rate had been used. The 2,4-D emulsifiable acid was less damaging. However, it greatly reduced the amount of new terminal growth, and killed some old needles, especially on the smaller pines. However, a year after treatment many of the damaged trees were recovering, and the mortality from the herbicide was estimated at 7 percent.

None of the three treatments in the white pine area eliminated honeysuckle, although the vines were usually killed back. A year later the honeysuckle had recovered its original density in both amitrole treatments, while the cover in the 2,4-D treatment was still about half of the original amount. The temporary effect of the treatments might still provide the freedom that trees need to dominate the site—if they are not also injured by the herbicide. The 2,4-D is most promising in this respect.

Even though the loblolly pines were appreciably taller than the white pines, the herbicide applications in June caused some damage. In the amitrole treatment, chlorotic foliage was noticeable on some trees by October. This included 25 to 85 percent of the needles on *upper* crowns of about 10 percent of the loblolly pines and a few needles on the lower branches of an additional 7 percent of the trees. Because affected trees were 10 to 20 feet tall, and those with upper-crown damage usually had unaffected foliage below, damage seemed to be due to translocation. In contrast, the 2,4-D treatment killed foliage on the lower branches (up to 6 or 8 feet), but left the upper crowns uninjured.

Bruner and Shearin (*2*) noted damage to loblolly pines where amitrole was used to control honeysuckle. They reported yellowing of needles and twisted leaders on the pines after applying 2 gallons of amitrole in 100 gallons of water, but stated that the damage usually disappeared within a year. They did not state the month of application.

In our loblolly pine area, both herbicides tended to kill back the honeysuckle cover, but left some spots with relatively unaffected vines.

In the hardwood area, the mixture of picolinic acid—2,4-D gave by far the best kill of honeysuckle. In that treatment no regrowth was noticed in June, and in October only one small clump of honeysuckle seedlings was found. However, the herbicide also killed all yellow-poplar reproduction, many sumacs, and all multiflora roses. Other vegetation, such as hickory and black walnut seedlings, was damaged; but the plants recovered. The 2,4-D treatments were less damaging to both hardwoods and honeysuckle. The 2,4-D ester reduced the honeysuckle cover only slightly, but damaged all the marked yellow-poplar seedlings (1 of 20

died). The 2,4-D emulsifiable acid produced a fair top-kill of honeysuckle, more than did the ester, but did not damage the yellow-poplars appreciably. Of 20 marked seedlings, 3 were unaffected, while the other 17 were injured but recovered.

Still less damage might have occurred if the 2,4-D treatments had been made 2 weeks or a month later. At the time of mistblowing most of the yellow-poplar leaves were yellow and a few were still green; only a few had fallen.

Conditioning treatments.—The mixtures of dicamba—2,4-D reduced the honeysuckle cover, but did not eliminate it. Survival varied with rate used, but in all treatments regrowth was appreciable after 1 year. However, the highest rate tried included only 0.6 pound of dicamba per acre, far less than the 4 pounds of dicamba (without 2,4-D) that eliminated much of the honeysuckle in a previous study (*4*).

In contrast, the mixtures of picolinic acid—2,4-D created a brown, barren appearance at the end of the 1966 growing season, even though there were a few spots with relatively unaffected honeysuckle. These spots were usually near tops or cull logs left after logging. By June 1967 very scattered sprouts of honeysuckle had appeared in other portions of these plots. On the basis of results in this study on plots where 8 gallons of water were used as the carrier (release treatment C in yellow-poplar reproduction) and results from a previous study (*4*) where high-volume sprays were applied, it seems probable that better distribution of the herbicide would have resulted in an almost complete kill. Hence, for similar conditioning treatments with a mistblower, the use of 8 gallons of water per acre is recommended.

Both rates of the 2,4-D—picolinic acid mixture were damaging to overstory yellow-poplar. The heavier rate was especially damaging. The damage was not very noticeable at the end of the 1966 growing season, but it became apparent in 1967. In June, 60 percent of the overstory yellow-poplar in the area treated with the 2-gallon rate showed light injury, mostly as cupped foliage, while the rest had severe injury (little foliage). In the area treated with the 3-gallon rate, 14 percent of the overstory yellow-poplar showed light injury in June, 72 percent were severely injured, and 14 percent seemed almost dead. However, none died during the summer. By fall all overstory yellow-poplar in both treatments appeared very sickly, having very thin crowns of deformed leaves.

Some of the vegetation was more resistant to the 2,4-D—picolinic acid herbicide. Some small oak and hickory seedlings lived. Catbrier resprouted, as did some perennial herbs, ferns, grasses, and sedges.

In June, a year after treatment, the ground cover was still very sparse, although close examination revealed the presence of many plants. These included new seedlings of black cherry, yellow-poplar, red maple, and pokeweed; and plants of false Solomon's-seal, May-apple, loosestrife, blackberry, strawberry, violets, and other herbs. By early October a new ground cover had developed, especially on the lower-rate plot. A dense cover of pokeweeds 3 to 4 feet tall mixed with scattered wild lettuce plants 6 to 9 feet tall dominated the site in the 2-gallon treatment, while in the 3-gallon treatment pokeweeds were much smaller and there were many spots with little herbaceous growth.

In contrast to the ground cover plants, the number and height of yellow-poplar seedlings in October 1967 seemed unaffected by the rate of 2,4-D—picolinic acid applied. All quadrats were stocked. The average number of yellow-poplar seedlings was 18,825 per acre, and the average height of the tallest seedlings on the 2-milacre quadrats was 0.4 foot.

In the southeastern United States, Bruner (*1*) found very rapid reinvasion of honeysuckle on bottomland sites, where honeysuckle seedlings grew so rapidly that in a year the vines reached the top of a yellow-poplar 14 feet tall. Such rapid regrowth has not occurred in our study areas, and the authors estimate that conditioning treatments such as outlined below would permit the dominance of yellow-poplar seedlings without later release from honeysuckle, under most conditions in the Northeast.

Tentative Recommendations

On the basis of the above results, tentative recommendations can be made for treating Japanese honeysuckle to release desirable reproduction or to prepare sites for reproduction.

FOR RELEASING REPRODUCTION FROM HONEYSUCKLE

White or Loblolly Pines 8 Feet or Taller

- Cut or pull down climbing vines so that spraying of pine foliage is not necessary.
- Use either mistblower or high-volume sprayer, but do not spray pine foliage.
- Use 4 pounds active ingredient of the 2,4-D emulsifiable acid per acre, in 8 gallons of water for mistblower applications or 100 gallons of water for high-volume sprays. Do not use amitrole.
- Treat during the summer or early fall, preferably after July.

White or Loblolly Pines Less Than 8 Feet Tall

- Cut or pull down climbing vines, and pull vines away from small trees where feasible.
- Use a high-volume sprayer.
- Use 4 pounds active ingredient of the 2,4-D emulsifiable acid in 100 gallons of water per acre. Do not use amitrole.
- Apply in late summer or early fall, being very careful *not* to spray pine foliage.

Yellow-Poplar Reproduction (2 to 12 Feet Tall)

- Cut or pull down climbing vines.
- Use either mistblower or high-volume sprayer. Mistblower seems preferable where drift is not a hazard.
- Use 4 pounds active ingredient of 2,4-D emulsifiable acid in 8 gallons of water per acre for mistblower applications.
- Treat in October or November after yellow-poplar leaves have become yellow or preferably have fallen. (When leaves are green, yellow-poplar seedlings are susceptible.)

FOR CONDITIONING YELLOW-POPLAR STANDS FOR REGENERATION

- Cut or pull down climbing vines more than 10 feet tall.
- Use mistblower where drift is not a problem, a high-volume sprayer where it is. Use extreme caution to avoid drift. Because a very small quantity of picolinic acid may injure tobacco, potatoes, or other crops at certain growth stages, the manufacturer does not recommend mistblower applications. So if there is any question of drift, use a high-volume spray.
- Apply 2 gallons of the 2,4-D—picolinic acid mixture per acre, in 8 gallons of water for mistblower treatments and 100 gallons of water for high-volume sprays. Be sure to wet all honeysuckle foliage if possible.
- Treat in late spring or early summer (May to early July) so residual effects will wear off enough that yellow-poplar seedlings can start the following year. But treat only if overstory trees will be harvested within

a year. If susceptible crops are growing nearby, a fall treatment seems preferable.

- Remove merchantable trees before the following growing season, and inject unmerchantable trees to provide desirable openings. Injection work might be delayed for a year because the spray treatment may make injection unnecessary on some trees.

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